A DOUBLE CLOUD VORTEX NEAR ANTARCTICA AS SEEN BY NIMBUS I HIGH RESOLUTION INFRARED

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Secondary cloud vortices moving in the circulations of major vortices, like that photographed by TIROS IX on February 8, 1965 and shown in the January 1966 "Picture of the Month" [1], are apparently not uncommon in the high latitudes of the Southern Hemisphere. A similar double vortex was detected by Nimbus I on September 11, 1964 [2]. A montage of four Nimbus High Resolution Infrared (HRIR) strips from consecutive orbital passes on this date is presented in figure 1. The times of these nighttime passes range from 0840 GMT for the easternmost pass to 1335 GMT for the westernmost pass. In this presentation of HRIR data, the brighter areas represent lower temperatures. These areas, therefore, are generally associated with higher cloud tops.

The HRIR montage, like the TIROS IX photograph, covers a large part of the South Pacific Ocean. The Antarctic continent, appearing bright because of its low temperature, is clearly outlined in the HRIR data. A major cloud vortex is centered over the Ross Sea, near 70° S., 170° W., with a cloud band extending northward to beyond 50° S. A smaller but well-defined vortex, appearing as bright as or brighter than the major vortex,

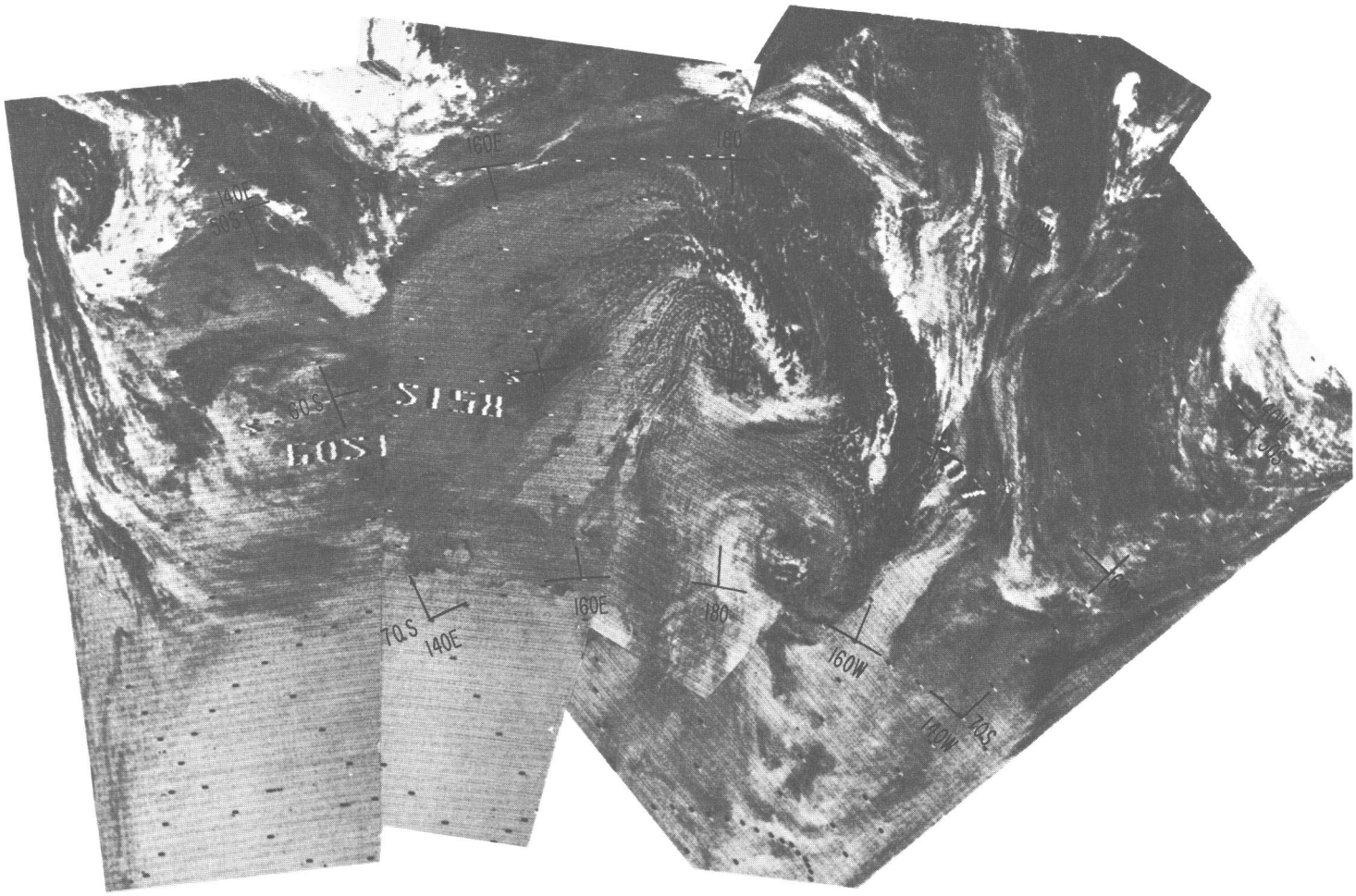

FIGURE 1.—Nimbus I HRIR, orbital passes 205–208, 0840–1335 GMT, September 11, 1964. The partial grid overlay is traced from the geographical grid produced automatically by the Nimbus system on the HRIR strips. Grid accuracy is within 2 deg. of great circle arc.

is centered near 60° S., 180°. The configuration of this double vortex pattern is remarkably similar to the pattern observed by TIROS IX, except that at the time of the HRIR observations the secondary vortex appears to be more to the west in relation to the primary center.

Although there are few corroborative data in this region, the principal vortex is similar in appearance to other HRIR-observed vortices that have been found to be associated with closed mid-tropospheric circulations [2]. The smaller vortex is undoubtedly associated with a vorticity maximum embedded in the southwest flow of the cold sector of the larger circulation, and is an example of the Southern Hemisphere counterpart of similar Northern Hemisphere vortices first identified by Rogers (cf. [3]).

At this time of year, Antarctica is surrounded by pack ice which extends northward to about 60° S. In the HRIR presentation, the pack ice appears warmer (darker) than the continent itself, but not as warm as the open ocean. The edge of the ice can be detected near 62° S., 158° E., just west of a colder (lighter gray) pattern that is apparently associated with the secondary vortex. This pattern, distinguishable to nearly 68° S., is probably lower cloudiness over the pack ice. Small areas, appearing slightly warmer than the rest of the ice, are seen along the Antarctic coast, such as near 70° S., 160° E.; these may be areas of broken ice, possibly resulting from local wind effects.

In addition to providing another example of a double vortex system, the HRIR montage demonstrates the ability of HRIR to provide nighttime cloud "pictures" that are compatible with daytime television pictures. It is also seen that HRIR can provide information on cloud cover over the Antarctic pack ice, where cloudiness can seldom be detected by television cameras.

REFERENCES

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2. W. K. Widger, Jr., J. C. Barnes, E. S. Merritt, and R. B. Smith, *Meteorological Interpretation of Nimbus High Resolution Infrared (HRIR) Data*, Final Report, Contract No. NAS5-9554, ARACON Geophysics Co., 1965 (Republished as NAS CR-352).
3. W. K. Widger, Jr., "A Synthesis of Interpretations of Extratropical Vortex Patterns as Seen by TIROS," *Monthly Weather Review*, vol. 92, No. 6, June 1964, pp. 263–282.

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